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Life cycle assessment of offshore wind projects: Beyond potential impact on climate change

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Introduction:

- ❖ **Wind energy:** One of the **most reliable** and **natural** sources of energy that reduces land use and noise pollution. Offshore wind farms are more efficient than onshore ones thanks to **constant winds** and their **higher speeds**.
- ❖ Despite the above-mentioned benefits, the life cycle of an offshore wind farm can have **potential environmental impacts**. A holistic sustainability approach is required to quantify these impacts. **Life Cycle Assessment (LCA)** is the most well-known tool to do so.

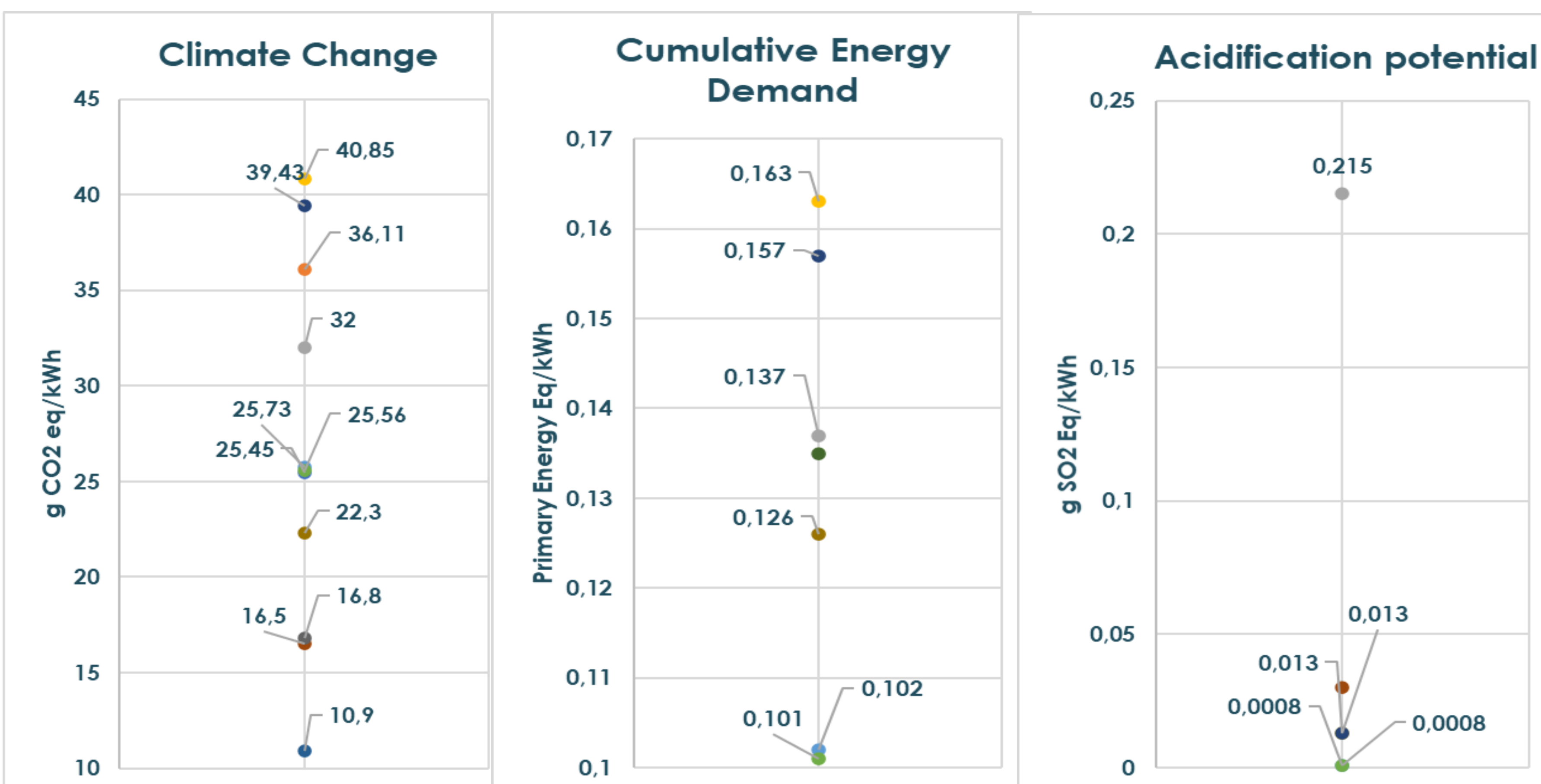
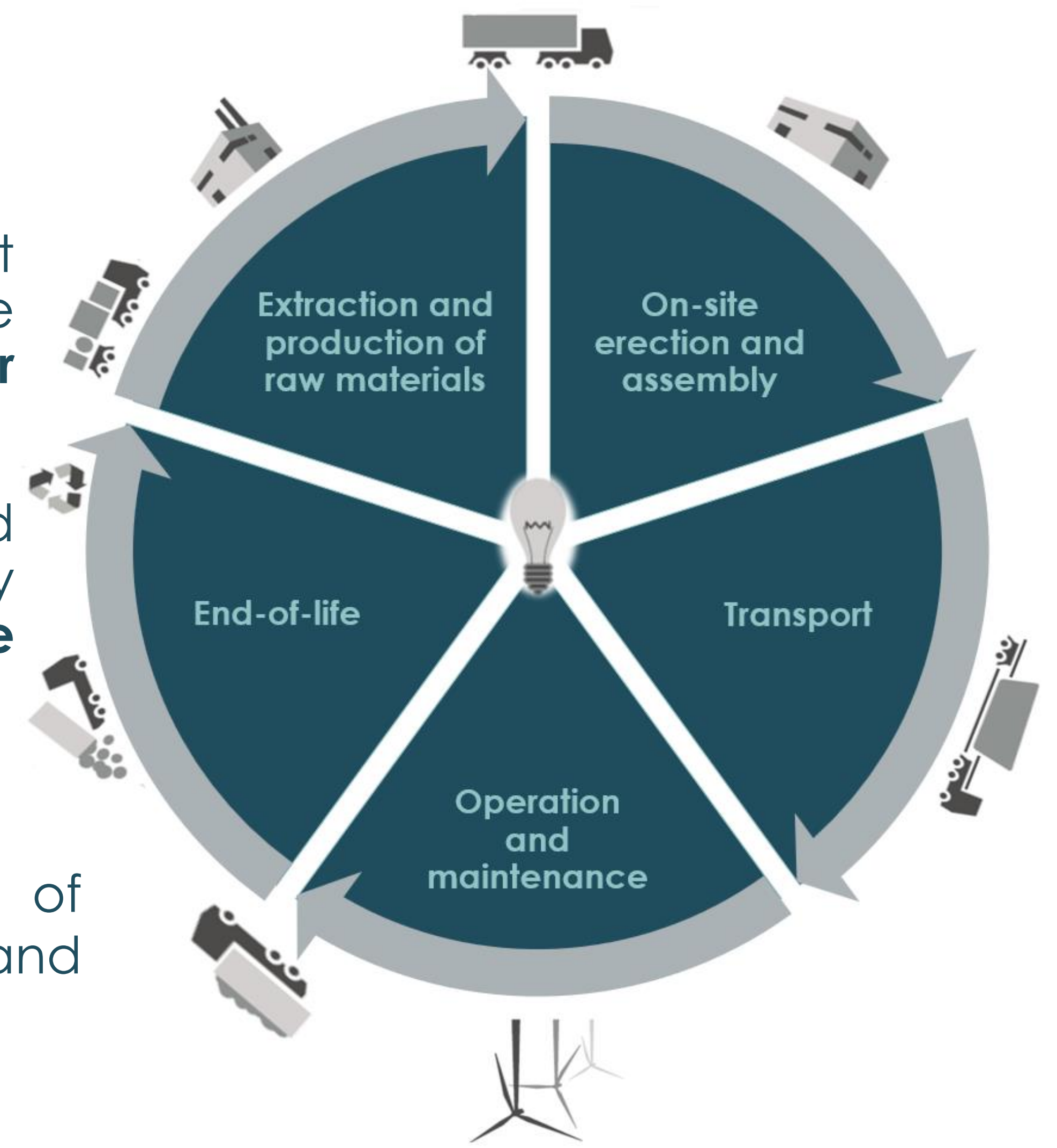
Aim:

- ❖ **Compare LCA studies** conducted for **offshore wind farms** in terms of functional unit, systems boundaries, considered environmental impacts, and the life cycle stages contributing the most to the environmental impacts.

Methodology:

- ❖ **11** selected scientific research papers estimate the environmental impacts of **offshore wind farms** using **Life cycle assessment**.

Results: Comparison between LCAs of offshore wind farms :



- ❖ 8/11 of the analyzed studies use the **functional unit "1 kWh of electricity"**. Different goals and scopes might also influence impacts assessment results.
- ❖ 2/11 considered additional impacts to **climate change** such as eutrophication, human toxicity, photochemical ozone creation, resource depletion.
- ❖ Large **variability** detected between reported results (Fig.1)
- ❖ The most contributing stage is the **production of raw materials** except for acidification. (Fig.2)

Fig1. Variability of the most considered impacts results per study

Conclusions and perspectives:

- ❖ Extending the life cycle impacts assessment to **more impact categories**.
- ❖ Identifying the most **influencing parameters** on impact assessment results.
- ❖ Developing a **methodological framework** to guide LCA studies to ensure a **better comparability** between **LCAs of offshore wind farms**.

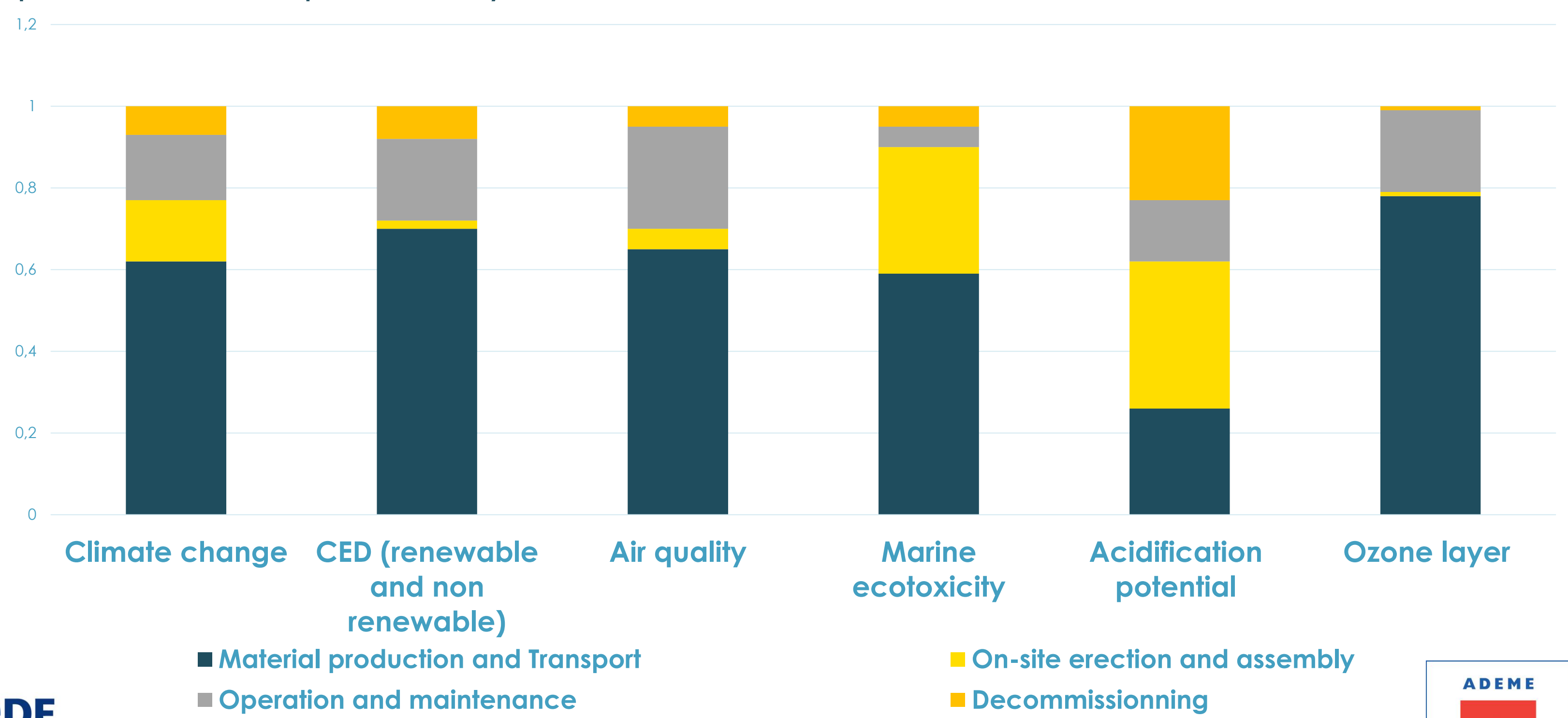


Fig2. Contribution of life cycle stages to the impacts